

Remarks

A. Status of the Application

Claims 1-56 are pending. Claims 1, 12, 16, 44, 49, and 55 have been amended. No new matter has been introduced. Claims 1-56 remain pending.

B. Clarifying Amendments to Claims 1, 16, 44, 49, and 55

Claims 1, 16, 44, 49, and 55 have been amended in a non-narrowing manner and not in response to any rejection or objection. Applicants amended those claims to clarify where signals are being applied. Support for the amendment may be found throughout the Specification, for example, in Example 2 entitled, "Illustrative Swept Frequency Electrosmeared Embodiments," and FIGS. 25A and 25B.

C. Objection to Claim 12

The Office has objected to claim 12 for including the use of a device. The Office contends that a method defined by the "use" of a device might be construed as being indefinite. Applicants respectfully traverse. The Office has not cited any rule to support its contention. Applicants respectfully assert that original claim 12 is proper. Nonetheless, Applicants have amended claim 12 in a non-narrowing manner to address the objection. Applicants request that this objection be withdrawn.

D. Section 102 Rejection

Claims 1, 13, and 49-51 stand rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by W.O. Patent No. 01/14870 to Frederick Becker *et al.* ("Becker"). Applicants respectfully traverse.

1. Claims 1 and 13 are Not Anticipated

Amended independent claim 1 recites, in part, "subjecting particles of a sample to a dielectrophoretic force by simultaneously applying a swept frequency signal to a first set of electrodes and a fixed frequency signal to a second set of electrodes." The cited anticipatory art fails to teach this and other limitations of claim 1.

The cited anticipatory reference discusses discriminating matter using dielectrophoresis and field flow fractionation. Becker discloses applying a signal with a signal frequency that

changes in a step-wise fashion to separate a mixture comprising multiple subpopulations (S_1 , S_2 , and S_3). *See* page 44, lines 23-25. First, signals with a first frequency (f_1) “would be applied to elute subpopulation S_1 , whilst ensuring slow movement of subpopulations S_2 and S_3 . After subpopulation S_1 is eluted from the chamber or is moved far ahead of the other two subpopulations, subpopulation S_2 may be eluted by changing the frequency to f_2 whilst still ensuring slow movement of subpopulation S_3 ...[F]inally, a signal of frequency f_3 may be applied to rapidly elute subpopulation S_3 .” (Page 44, line 27 through page 45, line 1). While the frequencies (f_1 , f_2 , or f_3) may include different frequency modulation, the frequencies applied to the mixture in Becker appear to continuously change with time. *See* page 39, line 20. Changing a frequency, either from one signal to a next signal (*e.g.*, from f_1 to f_2 after a time period) or by changing the frequency modulation (*e.g.*, changing the frequency of one signal over time) does not amount to a disclosure or suggestion of subjecting particles of a sample to a dielectrophoretic force by simultaneously applying a swept frequency signal to a first set of electrodes and a fixed frequency signal to a second set of electrodes, as recited by claim 1.¹ As such, Becker does not anticipate independent claim 1 or its dependent claims. Applicants respectfully request the removal of the § 102 rejection to claims 1 and 13 (dependent claim of claim 1).

2. *Claims 49, 50, and 51 are Not Anticipated*

Independent claim 49 has been amended to cite a similar limitation as claim 1, which recites, in part, “a dielectrophoretic field flow fractionator configured to subject particles of a sample to a dielectrophoretic force by simultaneously applying a swept frequency signal to a first set of electrodes and a fixed frequency signal to a second set of electrodes to segregate the particles into two or more zones...”

For at least the same reason set forth above, Becker does not teach or suggest the common limitation cited in independent claims 1 or 49. As such, claims 49 and dependent claims 50 and 51 are patentably distinct over Becker. Applicants respectfully request the removal of the § 102 rejection of these claims.

¹ Applicants’ comments are not directed to the scope of any Becker claims.

E. Section 103 Rejection

1. Claims 2-6 are Not Obvious

Claims 2-6 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Becker. Rejected dependent claims 2-6 are in condition for allowance for at least the reasons given above with respect to independent claim 1. Namely, the Becker reference does not disclose or suggest explicit elements recited in claim 1.

2. Claims 44 and 45 are Not Obvious

Claims 44, and 45 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Becker. Applicants respectfully traverse.

Amended independent claim 44 now recites, in part:

a first signal generator configured to apply a fixed frequency signal to a first electrode, the fixed frequency signal falling from a maximum intensity to a minimum intensity along a length of the surface in a first direction;
a second signal generator configured to apply a swept frequency signal to a second electrode, the swept frequency signal falling from a maximum intensity to a minimum intensity along the length of the surface in a second direction opposing the first direction, where the fixed frequency signal and the swept frequency signal are applied simultaneously

Support for the amendment may be found, for example, in FIGS. 25A and 25B and supporting text.

As noted above, Becker does not teach or suggest all the limitations of claim 1. Independent claim 44 and its dependent claims (45-48) recite a similar limitation as claim 1 and, therefore, are patentably distinct over Becker.

3. Claims 7-11 are Not Obvious

Claims 7-11 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Becker in view of U.S. Patent No. 6,387,707 to Seul *et al.* Applicants respectfully traverse.

Claims 7-11, which are dependent from claim 1, are patentably distinct over Becker for at least the same reasons outlined above. Additionally, while Seul contemplates spatial manipulation of colloidal particles and molecules, Seul does not augment the deficiencies of Becker. Seul discloses three elements used for manipulation: 1) an AC electric field-induced assembly; 2) spatial modulation of the interfacial impedance; and 3) real-time, interactive control over the state of the interfacial impedance by light. *See* Summary of Invention. The first element allows particles or molecules to respond to one AC electric signal. For example, FIG 2b illustrates an electric field (10Vp-p, 1kHz) that captures beads in the thin oxide region 22. *See* FIG. 2A; *see also* Example X, "Alignment and Stretching of DNA in Electric Field-Induced Flow"; *see also* FIGS. 12 through 15 and supporting text. Seul does not propose or suggest applying a particular, second signal. Seul does not need, desire, or require subjecting particles of a sample to a dielectrophoretic force by simultaneously applying a swept frequency signal to a first set of electrodes and a fixed frequency signal to a second set of electrodes because the three elements, including applying one AC field, are treated as being sufficient for parsing particles and molecules. Therefore, Becker and Seul, either separately or combined, do not teach or suggest all the elements of claim 1. Claims 7 through 11 are dependent claims of claim 1 and are patentably distinct over Becker and/or Seul.

4. *Claim 12 is Not Obvious*

Claim 12 stands rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Becker in view of U.S. Patent No. 4,250, 026 to Giddings *et al.* Applicants respectfully traverse.

Applicants submit that Giddings in combination with Becker do not teach or suggest all the elements of claim 12. Referring to FIG. ONE of Giddings, a sedimentation force, represented by vector F, is applied in one direction. Giddings discloses that "the device is tilted by use of rotational means 14 about an axis of rotation 16 so that the particles will sediment slowly across the enlarged width..." (Column 4, lines 4-6). Giddings notes that with the device on a tilt, the particles are "subject only to sedimentation forces [and] would distribute themselves over the thickness of the channel and would therefore be subjected to flow displacement velocities ranging from near zero at the wall to the maximum flow velocity at the center of the channel." (Column 4, lines 19-24). Nowhere in the disclosure of Giddings is a dielectrophoretic

force mentioned and, more pertinently, Giddings does not cure Becker's lack of disclosure or suggestion concerning subjecting particles of a sample to a dielectrophoretic force by simultaneously applying a swept frequency signal to a first set of electrodes and a fixed frequency signal to a second set of electrodes. As such, Becker in view of Giddings does not teach or suggest all the elements of claim 1. Claim 1 and its dependent claims, including claim 12, are patentably distinct over the cited references.

5. *Claim 14 is Not Obvious*

Claim 14 stands rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Becker in view of U. S. Patent No. 6,673,225 to William M. Arnold. Applicants respectfully traverse

Arnold involves applying negative dielectrophoretic forces to separate, collect, and/or manipulate particles or cells. *See* Abstract. However, the disclosure of Arnold, either separately or in combination with Becker, does not teach or suggest subjecting particles of a sample to a dielectrophoretic force by simultaneously applying a swept frequency signal to a first set of electrodes and a fixed frequency signal to a second set of electrodes. Arnold discloses different electrode configurations that can be used to apply an electric field to a sample. However, only one signal is applied where the "voltage applied to the electrodes to create the electric field within the medium is preferably an alternating voltage of a frequency in the range 100 Hz to 1000 MHz and more preferably in the range 10 kHz to 300 MHz, and may generate a field strength within the medium in the range 10 V/mm to 100 V/mm." (Column 3, line 67 through Column 4, line 3). As such, claim 14 is patentably distinct for at least the same reasons given for claim 1.

6. *Claim 15 is Not Obvious*

Claim 15 stands rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Becker in view of U. S. Patent Application No. 20020076825 to Cheng *et al.* Applicants respectfully traverse.

Cheng does not supply the deficiencies of Becker. In one example, Cheng discloses focusing moieties using dielectrophoresis, specifically traveling-wave dielectrophoresis. *See* page 21, paragraph 230. Separate groups of electrodes receive a separate AC signal with the

same frequency but with a different phase. A dielectrophoretic force is not provided by simultaneously applying a swept frequency signal to a first set of electrodes and a fixed frequency signal to a second set of electrodes, as recited by claim 1. Since claim 15 is dependent from claim 1, claim 15 is patentably distinct over Cheng and/or Becker.

7. *Claims 16-18, 20-25, 28-34, 43, 52 and 54 are Not Obvious*

Claims 16-18, 20-25, 28-34, 43, 52, and 54 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Becker in view Tripath Imaging's website. Applicants respectfully traverse.

Amended independent claim 16, recites:

A method comprising:

subjecting particles of a sample to a dielectrophoretic force to segregate the particles into two or more zones of a surface by simultaneously applying a swept frequency signal applied to a first set of electrodes and a fixed frequency signal to a second set of electrodes;

attaching the particles to the surface, thereby defining a segregated smear; and
fixing or staining the segregated smear.

Claim 16 has been amended to recite a similar limitation as independent claim 1. As noted above, Becker does not teach or suggest such a limitation. The Tripath Imaging's website ("website") does not supply features absent from Becker. The PrepStainTM uses a process that combines gravity dispersion and centrifugation to separate debris from a diagnostic material. The website and Becker, either separately or in combination, do not teach all the elements of claim 16. Therefore, claim 16 and its dependent claims are allowable.

Since independent claim 49 recites a similar limitation to claim 16 and Becker and/or the website fail to teach or suggest such a limitation, independent claim 49 and its dependent claims are patentably distinct for at least the same reason.

8. *Claim 19 is Not Obvious*

Claim 19 stands rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Becker in view Tripath Imaging's website and U.S. Patent No. 5,589,047 to Coster *et al.* Applicants respectfully traverse.

As noted above, neither Becker nor Tripath Imaging's Website, either separately or in combination, teach or suggest all the elements of claim 16. Coster does not supply the absent elements. Coster describes methods for separating, selecting, and/or, fusing cells. Coster discloses applying a dielectrophoretic force on the cells as "the frequency of an alternating electric field is applied to the cell 10." Column 8, lines 10-12. It appears that Coster applies only one signal with one frequency to the cells. As such, claim 19 is patentably distinct for at least the same reason given for claim 16.

9. *Claims 26 and 27 are Not Obvious*

Claims 26 and 27 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Becker in view of Tripath Imaging's website and U.S. Patent No. 5,858,192 to Becker *et al* ('192 reference). Applicants respectfully traverse.

Becker and/or Tripath Imaging's website do not teach or suggest all the elements of claim 16 as outlined above. The '192 reference does not cure the deficiencies. The '192 reference teaches manipulating matter using an electric field (from a cDEP force and a twDEP force) and/or externally applied fluid flow forces. Referring to FIG. 2A and 2B of the '192 reference, an "electric field can be applied to the electrode elements 5 creates conventional dielectrophoretic forces on the particles in accordance with their dielectric and conductive properties as well as those of the carrier medium." Column 18, lines 42 through 46. Chamber 10 of FIG. 2A and 2B also utilizes twDEP forces in addition to cDEP forces, thereby displacing matter in two-dimensions (vertical and horizontal). Column 19, lines 30-32. However, it appears that the electrical signals applied to the electrode elements 5 for either a cDEP case, a twDEP case, or twDEP case are applied over the entire sampling area of chamber 10. A dielectrophoretic force is not provided by simultaneously applying a swept frequency signal applied to a first set of electrodes and a fixed frequency signal to a second set of electrodes, as recited by claim 16. As such, claims 26 and 27 are patentably distinct over the cited references.

10. *Claim 35 is Not Obvious*

Claim 35 stands rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Becker in view of the Tripath Imaging's website and Cheng *et al*. Applicants respectfully traverse.

As noted above, Becker and/or Cheng do not teach or suggest the limitations of independent claim 1. Independent claim 16 has been amended to include a similar limitation to claim 1 that recites subjecting particles of a sample to a dielectrophoretic force by simultaneously applying a swept frequency signal to a first set of electrodes and a fixed frequency signal to a second set of electrodes. Neither Becker nor the website teach or suggest all the limitations of claim 16. In addition, Applicants submit that Cheng does not teach or suggest all the limitations of claim 16 for at least the same reason Cheng did not teach or suggest the similar limitation recited in claim 1. *See* Section E.6 of this Response. Claim 35, a dependent claim of 16, is patentably distinct over the cited references for at least the same reasons as given for claim 16.

11. Claims 36-40 are Not Obvious

Claims 36-40 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Becker in view of the Tripath Imaging's website and Seul. Applicants respectfully traverse. Claims 36-40 are allowable for at least the reasons given for claims 1 and 16.

12. Claim 41 is Not Obvious

Claim 41 stands rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Becker in view of the Tripath Imaging's website and Giddings. Claim 41 is allowable for at least the same reasons given for claims 1 and 16.

13. Claim 43 is Not Obvious

Claim 43 stands rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Becker in view of the Tripath Imaging's website and Arnold. Claim 43 is allowable for at least the same reasons given for claims 1 and 16.

14. Claims 46 and 47 are Not Obvious

Claims 46 and 47 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Becker in view of Seul. Applicants respectfully traverse.

Becker does not teach or suggest all the limitations of claim 44. *See* Section E.2 of this Response. Claim 44 includes hardware limitations that require a first signal generator configured to apply a fixed frequency signal to a first electrode, the fixed frequency signal falling from a

maximum intensity to a minimum intensity along a length of the surface in a first direction; a second signal generator configured to apply a swept frequency signal to a second electrode, the swept frequency signal falling from a maximum intensity to a minimum intensity along the length of the surface in a second direction opposing the first direction, where the fixed frequency signal and the swept frequency signal are applied simultaneously. As noted above, Seul fails to teach or suggest applying more than one frequency signal. As such, Seul combined with Becker does not teach all the limitations of claim 44. Since claims 46 and 47 are dependent claims of claim 44, they are patentably distinct for at least the same reason as claim 44.

15. Claim 48 is Not Obvious

Claim 48 stands rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Becker in view of Giddings. In light of the above remarks, Applicants respectfully traverse.

As noted above, Becker does not teach or suggest all the limitations of claim 44. Giddings teaches applying a sedimentation force on to a sample and tilting the chamber such that the particles settled into various flow velocities. Nowhere in Giddings are there teachings or suggestions for a first and second signal generator, or similar apparatuses. As such, the combination of Becker and Giddings fails to teach or suggest all the limitations of claim 48.

16. Claims 55 and 56 are Not Obvious

Claims 55 and 56 stand rejected under 35 U.S.C. §103(a) as allegedly being obvious over the Tripath Imaging's website in view of Becker. Claims 55 and 56 are allowable for at least the same reasons given for claims 1 and 16.

Thus, in light of the foregoing comments, Applicants respectfully request the withdrawal of all the § 103(a) rejections.

Petition for Extension of Time

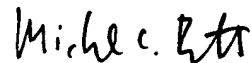
Pursuant to 37 C.F.R. § 1.136(a), Applicants petition for an extension of time of three-months up to and including April 27, 2005, in which to respond to the outstanding Action. A check for the small entity fee for a three-month extension of time (\$510.00) is enclosed. Should any additional fees under 37 C.F.R. §§ 1.16 to 1.21 be required for any reason relating to the enclosed materials, or should an overpayment be included, the Commissioner is authorized to deduct or credit said fees to or from Fulbright & Jaworski Deposit Account No. 50-1212/UTXC:760US/MCB.

Conclusion

Applicants believe that these remarks fully respond to all outstanding matters for this application. Applicants respectfully request that the rejections of all claims be withdrawn so the claims may swiftly pass to issuance.

Should the Examiner desire to sustain any of the rejections discussed in this Response, the courtesy of a telephone conference between the Examiner, the Examiner's supervisor, and the undersigned attorney at 512-536-3018 is respectfully requested in advance.

Respectfully submitted,



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